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ADDITIONS TO THE MIOCENE FAUNA OF NORTH FLORIDA

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No. 4—*Additions to the Miocene Fauna of North Florida*

By Theodore E. White

The late Dr. Thomas Barbour always maintained a keen interest in the excavations on the Thomas Farm in North Florida. With the aid of the two men who served us so well in the past, he continued the excavations during the period of hostilities. The material accumulated during this period, and that which the writer collected in the winter of 1946 has added six genera and seven species to the fauna of this deposit, as well as increasing our knowledge of previously described forms. Three of the genera were previously known only from the Upper John Day-Lower Rosebed and two from the Middle and Upper Miocene deposits of the Plains. Consequently the correlation of these deposits on the basis of the fauna is still in the same paradoxical position that it was.

The number of forms known from fragments too imperfect for proper diagnosis remains distressingly large. To date the list is: didelphids, an imperfect lower molar and a toothless lower jaw; insectivores, a single lower molar; rodents, incisors, cheekteeth and footbones; mustelids, isolated teeth and toothless lower jaws.

Family MUSTELIDAE

Aelurocyon spissidens spec. nov.

Type. M. C. Z. 4246 (Fig. 1, A and B), portion of left mandible with P_4 and M_1 and the alveoli for P_{2-3} and M_2.

Horizon and Locality. L. Miocene, L. Arikareean, Thomas Farm, Gilchrist Co., Florida.

Diagnosis. A small species, about one-third smaller than *A. brevifacies* Peterson; teeth higher crowned; premolars crowded together, overlapping, and set obliquely in the jaw with the anterior end slightly lateral to the posterior; fourth premolar with a small but well defined anterior tubercle, posterior tubercle and accessory cusp well developed; carnassial with small tubercle between protoconid and hypoconid; second molar two-rooted.

Measurements (in millimeters)

	spissidens		*brevifacies**	
	Length	Width	Length	Width
P_2 to M_2 (alveolar)	48			
P_4	10	5	17	10
M_1	17	7	21	10
Depth of jaw at P_3	19		35	
" " " " M_2	21		37	

* Taken from Peterson, O.A., 1906 C.

Discussion. There appears to be a vestige of the metaconid represented by a minute tubercle on the postero-medial side of the protoconid. There is a low narrow cingulum on the medial side of the heel of the carnassial and the hypoconid is placed more laterally than medially. There was a small premolar crowded in between the canine and the second premolar. The posterior portion of the mandible was broken away and the presence or absence of a third molar could not be determined. There are two mental foramina of nearly equal size.

Oligobunis floridanus spec. nov.

Type. M. C. Z. 4064 (Fig. 1, C and D), left mandible with P_3 to M_1.

Horizon and Locality. L. Miocene, L. Arikareean, Thomas Farm, Gilchrist Co., Florida.

Diagnosis. Slightly larger than *O. crassivultus* Cope; second premolar with single bilobed root; third premolar with distinct heel and minute accessory cusp; fourth premolar with distinct heel and accessory cusp; carnassial narrows abruptly posterior to the protoconid, shear very oblique, metaconid strong and as high as the paraconid, width of heel equal to two-thirds the width at the metaconid.

Measurements (in millimeters)

	Length	Width
P_3 to M_1	36	
P_3	8	4.0
P_4	11	5.5
M_1	17	8.0

Discussion. Although the jaw was badly crushed, it is believed that approximately the correct curvature was obtained in the restoration.

The teeth show little wear, except the carnassial, which exhibits the characteristic mustelid wear. This specimen does not permit us to add anything to the discussions of this genus given by Matthew (1907 A), Thorpe (1921 C), and Loomis (1932 A).

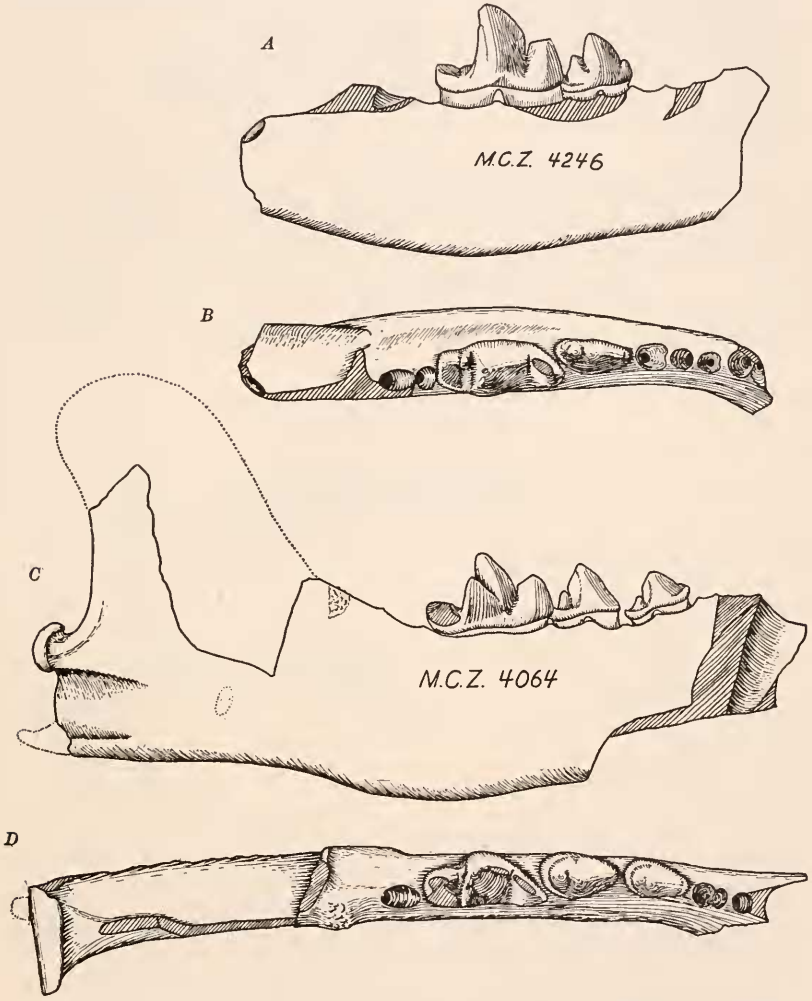

Fig. 1. A and B, *Aelurocyon spissidens* sp. nov., type, medial and occlusal views. x 1. C and D, *Oligobunis floridanus* sp. nov., type, medial and occlusal views. x 1.

Family CANIDAE

Paractis bathygenus spec. nov.

Type. M. C. Z. 3931 (Fig. 2, B and C), portion of left mandible with P_4 to M_2.

Referred Specimen. M. C. Z. 3930 (Fig. 2, A), a partial palate with P^4 to M^2 of both sides.

Horizon and Locality. L. Miocene, L. Arikareean, Thomas Farm, Gilchrist Co., Florida.

Diagnosis. As large as *Mesocyon coryphaeus*; mandible deep and massive, depth at the anterior end of the first molar nearly equal to the combined length of the first and second molars; fourth premolar with minute tubercle and accessory cusp; heel of carnassial with large hypoconid and small entoconid; second molar seven-ninths as broad as long, protoconid and metaconid opposite and subequal, paraconid represented by a minute tubercle, hypoconid small but distinct.

Measurements (in millimeters)

M. C. Z. 3931

Depth of mandible between P_4 and M_1	22
" " " " M_2 and M_3	25

	Length	Width
P_4 to M_2	34	
P_4	10	4.5
M_1	15	7.0
M_2	9	7.0

M. C. Z. 3930

P^4 to M^2	27	
P^4	14	8.5
M^1	10	12.0
M^2	5	8.0

Discussion. The basis for referring the upper dentition to this species is its excellent occlusion with the type. The upper dentition bears a close resemblance to that of *Mesocyon* but differs in the following respects: On the fourth premolar the deuterocone is better developed and is slightly constricted off from the paracone. On the labial side the enamel does not curve so sharply downward, posteriorly. On the first molar the external cingulum is less pronounced and the internal cingulum forms a low, broad ridge which is slightly crenulated on the labial side. The protocone is not so well developed. The reëntrant

angle on the posterior side of the tooth, medial to the protocone, is more pronounced. The second molar is less well developed and the reëntrant angle on the posterior side of the tooth is more pronounced.

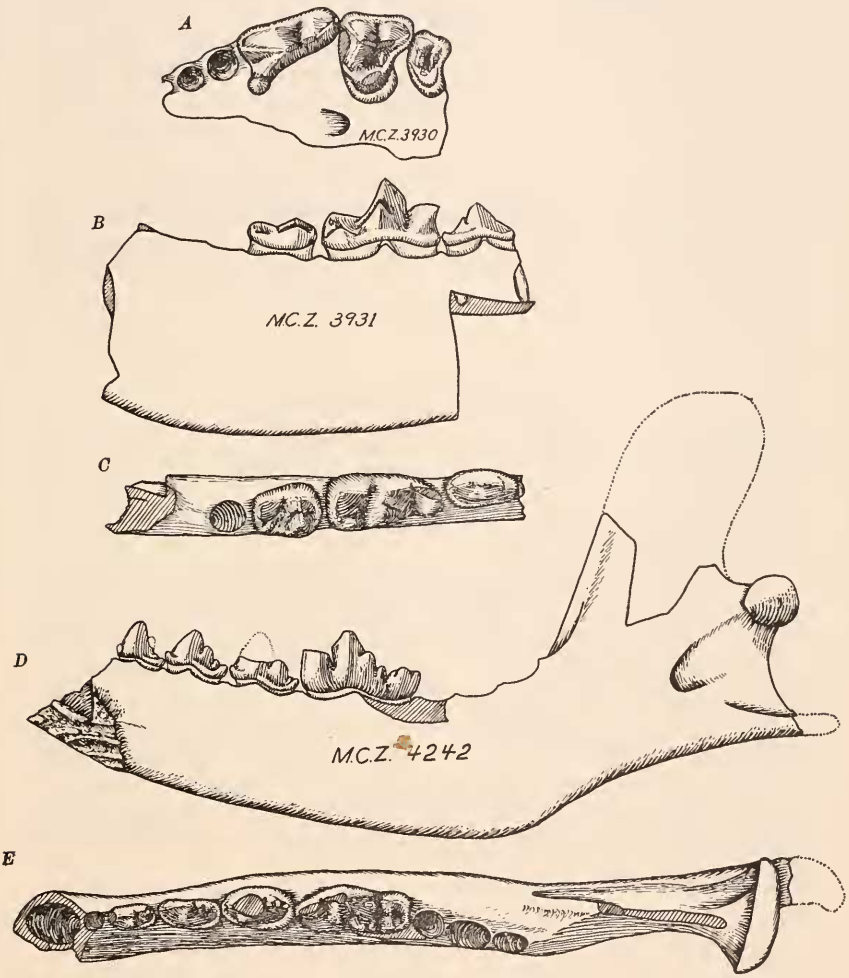

Fig. 2. A, *Parictis bathygenus* sp. nov., referred specimen, occlusal view. x 1. B and C, *Parictis bathygenus* sp. nov., type, medial and occlusal views. x 1. D and E, *Nothocyon insularis* White, medial and occlusal views. x 1.

The type of *Mesocyon hortulirosae* Schlaikjer and a cast of the type of *M. drummondanus* Douglass were used for comparison.

A comparison of the type with a specimen of *Amphicynodon rossignoli* (Filhol) shows, as Scott & Jepsen (1936) pointed out, that the two genera are, indeed, closely related. However, the fourth premolar of this species does not have the well developed accessory cusp found on *P. primaevus* Scott, *P. dakotensis* Clark, and *A. rossignoli* (Filhol). In addition to the above resemblances, the characters of the lower teeth and the massiveness of the lower jaw appear to be prophetic of *Ursavus* Schlosser.

On the basis of this specimen and other fragmentary material in the Museum of Comparative Zoölogy, it seems highly probable that more than one genus was living in North America during the Oligocene and Miocene. However, a division, based on the imperfect and limited material now available, is entirely unwarranted.

Nothocyon insularis White

Bull. Mus. Comp. Zoöl., **92**, No. 1, p. 7, Pl. 1, fig. 3, 1942.

Referred Specimen. M. C. Z. 4242 (Fig. 2, D and E), right mandible with P_2 to M_1.

Horizon and Locality. L. Miocene, L. Arikareean, Thomas Farm, Gilchrist Co., Florida.

Discussion. The specimen is referred to this species on the basis of occlusion with the type. Although there is little difference in the alveolar length (63 to 67 mm.) between this specimen and a referred specimen of *Tomarctus canavus* Simpson, it is much lighter in construction and more slender throughout. The condyle of the jaw is shorter, smaller, and set at an oblique angle with the mandible, indicating a broad skull for this form. The individual teeth are smaller and shorter crowned, but the cusps agree in position with those of *T. canavus*. As in *Nothocyon vulpinus coloradoënsis* Thorpe (1922 E) the heel of the carnassial shows the ridge between the hypoconid and entoconid that is characteristic of *Tomarctus*.

Measurements (in millimeters)

	N. insularis	*T. canavus*
M. C. Z. number	4242	3628
Alveolar length (exclusive of canine)	63	67

	N. insularis		*T. canavus*	
	Length	Height	Length	Height
P_2	8	5	7.5	5
P_3	8.5	5.5	8.5	6
P_4	9	—	10	7.5
M_1	16	8.5	17	10
Depth of jaw at P_3	15		18	
" " " " M_1	17		21	

AELURODON JOHNHENRYI spec. nov.

Type. M. C. Z. 4059 (Fig. 3, B and C), right mandible with C, P_2 to M_2.

Horizon and Locality. L. Miocene, L. Arikareean, Thomas Farm, Gilchrist Co., Florida.

Diagnosis. As large as *A. haydeni* (Leidy) but with a relatively longer jaw; second and third premolars elongate antero-posteriorly and with relatively low principal cusp; second, third, and fourth premolars widest a little posterior to their midlength and with posterior tubercle and accessory cusp; third and fourth premolars with minute anterior tubercle; carnassial of the same size and proportions as *A. haydeni*, hypoconid well developed, entoconid small; second molar with protoconid and metaconid opposite and subequal, protoconid larger, hypoconid well developed and placed medially on the heel, no entoconid.

Measurements (in millimeters)

C to condyle	203	
Depth of jaw at M_2	42	
	Length	Width
P_2	12	6
P_3	14	7
P_4	18	10
M_1	34	14
M_2	21	15

Discussion. Although the anterior premolars of this form are very different from those of other species of *Aelurodon*, it agrees so well with the characters of that genus, as set forth by Vanderhoof and Gregory (Univ. Calif. Publ., Bull. Dept. Geol. Sci., **25**, No. 3, pp. 143-164, 1940), that a separate genus seems unwarranted. These authors derive *Aelurodon* from *Tomarctus* through an as yet unknown species. The second and third premolars give this species an isolated position

in the genus *Aelurodon*, but it exhibits a number of characters which have not departed far from the condition found in *Tomarctus*. These characters are: the nearly straight tooth line, the general form of the premolars, the unreduced metaconid on the carnassial, the unreduced second molar, and the general form of the mandible.

Family PROTOCERATIDAE

Synthetoceras (Prosynthetoceras) douglasi spec. nov.

Type. M. C. Z. 4065 (Fig. 3, A), a badly crushed palate with P^3 to M^3 of both sides.

Horizon and Locality. L. Miocene, L. Arikareean, Thomas Farm, Gilchrist Co., Florida.

Diagnosis. Smaller than *S. francisi*; anterior external style on third and fourth premolars less well developed; first and second molars as in *francisi*; external and internal mesostyles on the third molar as in *Protoceras*; anterior and posterior cinguli on the second molar and anterior cingulum on the third molar.

Measurements (in millimeters)

P^3 to M^3	66	
	Length	Width
P^3	9	6
P^4	9	9
M^1	14	13
M^2	17	15
M^3	17	16

Discussion. Unfortunately the bone in this specimen was very poorly preserved and it tended to disintegrate on exposure. It was saved only with great difficulty. The portions of the skull which would have borne the horns are missing. The internal nares are large and anterior in position. Their anterior border is opposite the posterior crescent on the second molar. It is impossible to determine the presence or absence of a second premolar. The third premolar is similar to that of *S. francisi* except that the anterior external style is not so well developed. The fourth premolar is as broad as long while in *francisi* it is broader than long. The first and second molars agree with those of *francisi* except that the posterior cingulum on the second molar

is better developed in this form. The third molar resembles that of *Protoceras* more than it does that of *S. francisi*. In general, this form is less advanced toward the peculiar specializations of the genotype than the other members of the genus.

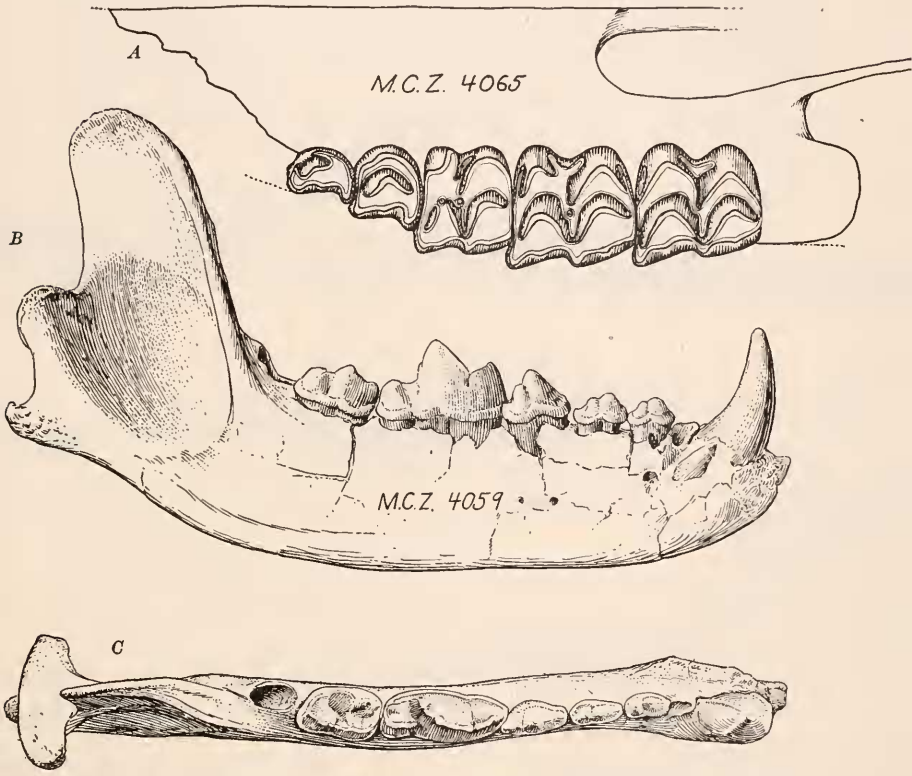

Fig. 3. A, *Synthetoceras douglasi* sp. nov., type, occlusal view. x 1. B and C, *Aelurodon johnhenryi* sp. nov., type, lateral and occlusal views. x ½.

Family HYPERTRAGULIDAE

Floridatragulus barbouri spec. nov.

Type. M. C. Z. 4086 (Fig. 4) a left mandible with C, P_2 to M_3.

Horizon and Locality. L. Miocene, L. Arikareean, Thomas Farm, Gilchrist Co., Florida.

Diagnosis. Smaller than *F. dolichantherius* and with a much shorter diastema between the second and third premolars.

Measurements (in millimeters)

		barbouri	*dolichantherius*
Diastema,	C to P_1	29	41
"	P_1 to P_2	38	43
"	P_2 to P_3	10	32
Length,	P_3 to M_3	69	75
"	M_1 to M_3	49	55

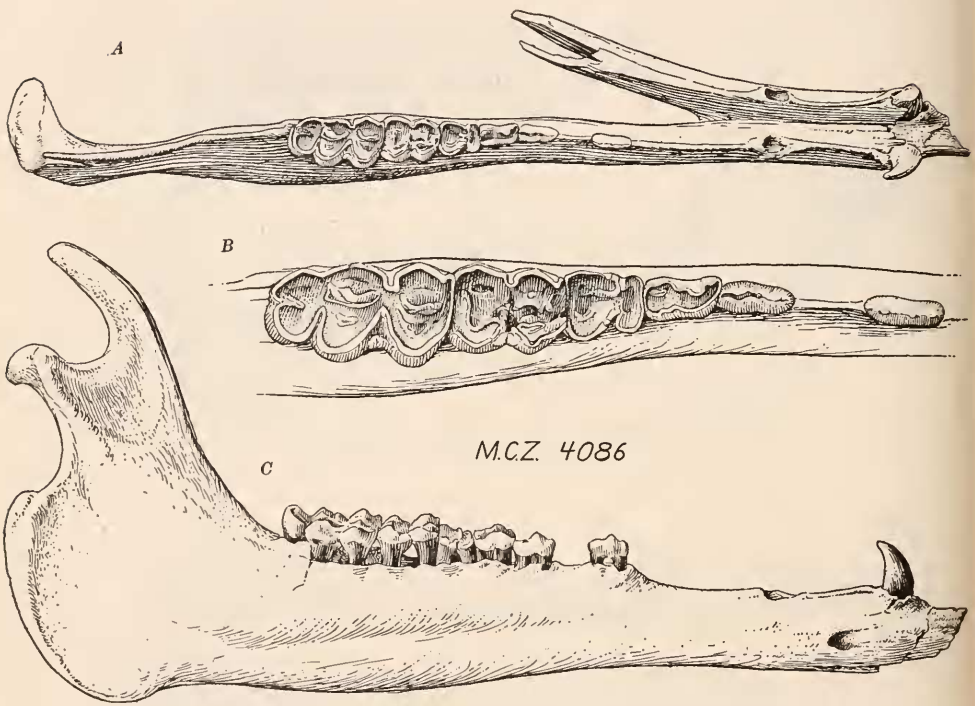

Fig. 4. *Floridatragulus barbouri* sp. nov., type, occlusal and lateral views. A and C, x ½, B, x 1.

	Length	Width	Length	Width
P_2	10.5	3		
P_3	10.5	4		
P_4	9	5		
M_1	10	9	13	9
M_2	15	11	16	11
M_3	24	12	26	12

Discussion. Since the canine and the second premolar do not show any wear, it is probable that they did not occlude with any of the upper teeth. The canine is short, compressed, and strongly recurved. The premolars resemble those of *Leptomeryx* in that the anterior and posterior cusps are nearly as high as the central. The second premolar is low, compressed, and has a rudimentary antero-internal fold. The third premolar has a stronger antero-internal fold and a rudimentary postero-internal fold. The fourth premolar has well developed antero-internal and postero-internal folds. The molars resemble those of *Leptomeryx* in that the external style between the crescents is rudimentary.

As yet no skeletal material certainly referable to this group of hypertragulids has been found.

Family TAYASSUIDAE

Floridachoerus olseni White

Proc. New Eng. Zoöl. Club, **18**, p. 93, Pl. 14, Fig. 4, 1941.

Referred Specimen. M. C. Z. 4290 (Fig. 5, C), a palate with left P^2 to M^3 and right M^1 to M^3.

Horizon and Locality. L. Miocene, L. Arikareean, Thomas Farm, Gilchrist Co., Florida.

Revised Generic Diagnosis. I^{1+}, C, P^4, M^3, no diastema behind canine; first premolar two-rooted and placed medial to the posterior portion of the canine; second premolar three-rooted with a single principal cusp, a strong ridge between the cusp and the internal cingulum, external and internal cinguli well developed; third premolar similar to the second but larger and with the external cingulum less well developed; the fourth premolar with two principal cusps and with a well developed cingulum running all the way around the tooth; strong ridges run antero-laterally and postero-laterally from the medial cusp so that the cusp sits at the apex of a well defined crescent; molars four-cusped and with moderately well developed anterior and posterior cinguli; third molar with small accessory cusps placed medially on the anterior and posterior borders.

Measurements (in millimeters)

I^3 to canine	13	
P^1 to M^3	96	
P^1 to P^4	48	
	Length	Width
P^1 (alveolus)	9	—
P^2	10.5	10
P^3	13	14.5
P^4	12	17

The molars were damaged so that reliable measurements could not be taken.

HYPERTRAGULOIDEA, *incertae sedis.*

Nothokemas gen. nov.

Genotype. Paratylopus grandis White; Proc. New Eng. Zool. Club, **18**, p. 33, Pl. 5, 1940.

Diagnosis. A large hornless artiodactyl with unreduced nasals; lacrymal vacuity as large as the orbit; rostrum high, narrow, and moderately elongate; postorbital bar complete; teeth slightly more hypsodont than *Syndyoceras*; premolars and molars similar to those of *Protoceras*; internal crescents of the upper molars and the external crescents of the lower molars separate to the base of the tooth; mesostyle of the molars rudimentary; heel of third lower molar single lobed; orbit and internal nares posterior to third upper molar; cuboid and navicular probably separate.

Referred Material. M. C. Z. No. 4329 (Fig. 6) a crushed skull with occiput and tip of the rostrum missing; No. 4322 (Fig. 5 A) right maxilla with P^2 to M^3; No. 4325 (Fig. 5 B and 6 C), left mandible with M_1 to M_3; No. 4323, left mandible with P_3 to M_3; No. 4324 (Fig. 5 B), left mandible with P_2 to P_4; No. 4326, left mandible with Dp_{3-4} M_{1-2} No. 4328 left maxilla with $Dp^{2-4}M^1$.

Horizon and Locality. L. Miocene, L. Arikareean, Thomas Farm, Gilchrist Co., Florida.

Discussion. These specimens supplement each other, so that it is possible to get a reasonably reliable concept of the skull and dentition of this genus. The skull (Fig. 6) is elongate with a moderately high, narrow rostrum. The orbit appears to have been nearly circular and completely closed behind. It is located nearly one-half of its diameter posterior to the last molar. The lacrymal vacuity is quadrangular in

outline and is contained entirely within the maxilla. The superior and postero-inferior edges are thickened. Its diameter nearly equals that of the orbit from which it is separated by a distance equal to two-thirds of its diameter. The anterior tip of the nasals has been lost but the part preserved, from a point opposite the first premolar, shows no evidence of emargination. They are long and narrow and are suturally united with the maxillaries. The profile appears to have been nearly straight.

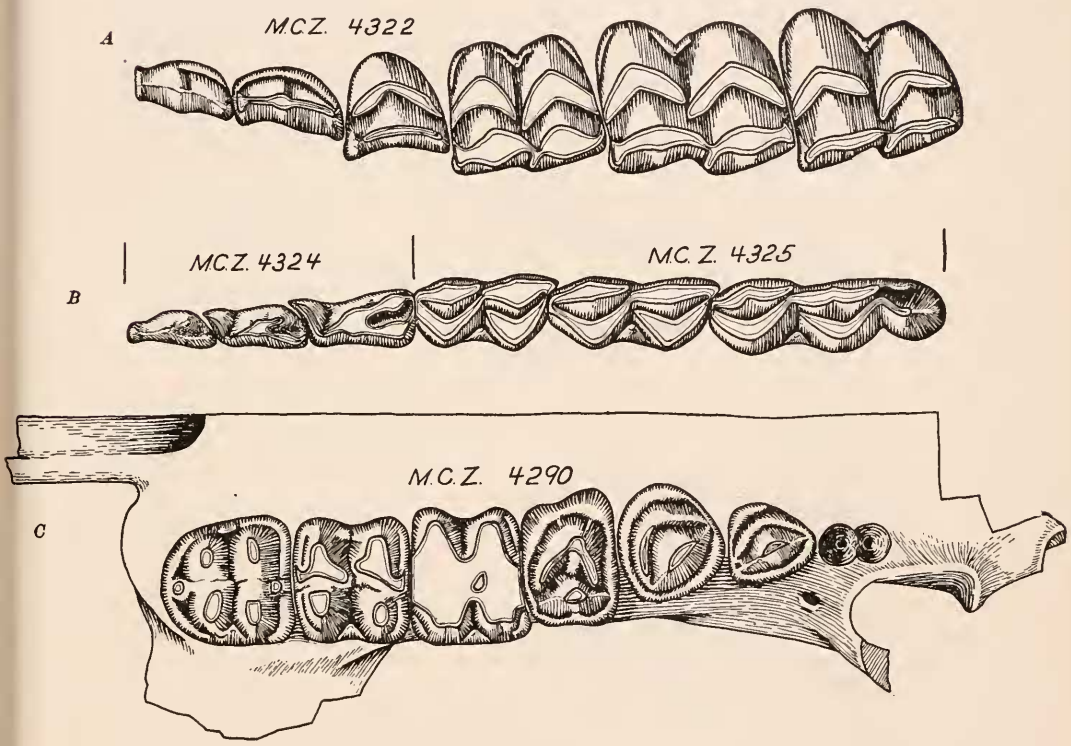

Fig. 5. A and B, *Nothokemas grandis* (White), occlusal views of upper (A) and lower (B) dentitions. x 1. C, *Floridachoerus olseni* White, occlusal view of upper dentition. The molars have been restored from the type and individual teeth. x 1.

The palate is very narrow anteriorly and wide posteriorly with the internal nares opening posterior to the last molar. The first premolar is represented by a very small oval alveolus which is separated from the

other teeth by a diastema on either side. The second premolar (Fig. 5, A) is two-rooted, compressed, elongated and with the cusps poorly developed. The third premolar is three-rooted with a strong internal cingulum. The outer crescent is similar to that of the second premolar

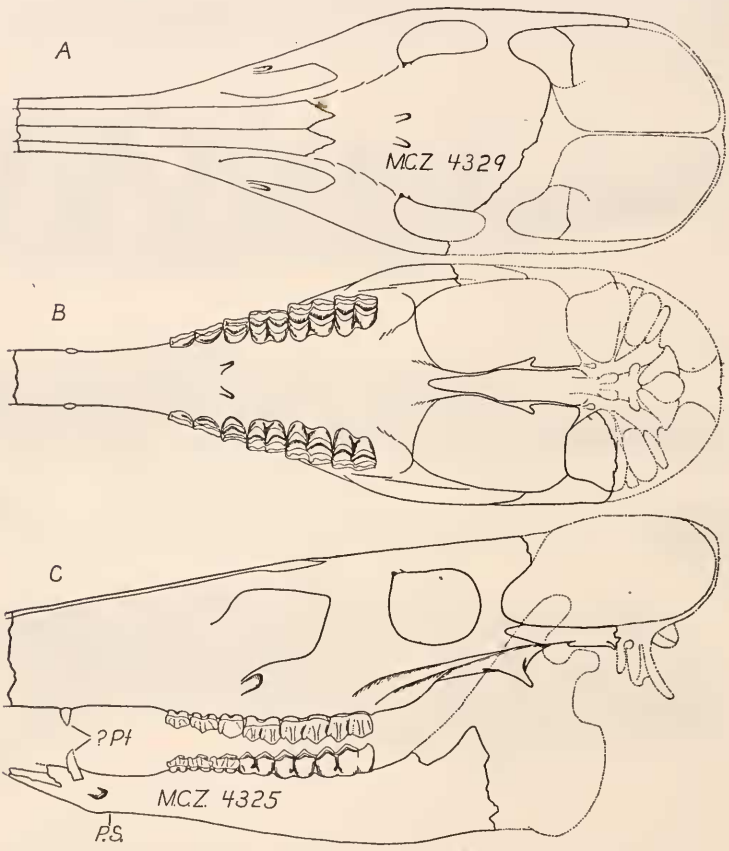

Fig. 6. *Nothokemas grandis* (White), restoration of the skull and lower jaw, (A) dorsal, (B) palatal views of the skull, (C) lateral view of skull and lower jaw. P.S. - posterior border of the symphysis. x ¼.

but with the cusps better developed. The fourth premolar and the molars differ from those of *Protoceras* principally in size and height of crown.

The form of the lower jaw (Fig. 6, C) is best shown by that of a young adult (No. 4325) in which the incisor region is badly damaged and the posterior end missing. The general form is of the cervoid type with a very long symphysis, which is incompletely fused in the old individuals. The posterior border of the symphysis is located about halfway between the first and second premolars and just behind the mental foramen. The anterior portion of the jaw is too poorly preserved to show any details of the sockets for the incisors or the canine. The second premolar (Fig. 5, B), is compressed, with a rudimentary antero-internal fold and a postero-internal fold which extends about halfway to the posterior end of the tooth. The third premolar has well developed antero-internal and postero-internal folds. In neither the second nor the third premolars would the postero-internal folds enclose a lake of enamel with wear. The fourth premolar has strong antero-internal and postero-internal folds. Near its posterior end, the latter is swollen into a cusp which constricts the enclosed enamel lake at about the middle of its length. This cusp appears to be homologous with the postero-internal cusp of *Leptomeryx*. The first and second molars differ from those of *Protoceras* only in the larger size and the greater height of crown. The third molar differs from all other members of this group in that the heel has only a single lobe, the outer. The inner lobe is represented by a short extension of the posterior crescent and is separated from the outer lobe to the base of the tooth. From the material at hand, it is impossible to be certain whether this is a rudimentary condition, which has persisted, or that the inner lobe has become reduced. This result could have been achieved by increasing the height of the crowns of the teeth of an Eocene hypertragulid such as *Leptotragulus*.

The artiodactyl tarsal material from this deposit was reviewed in the hope that some information relative to the affinities of the known forms could be obtained. Forms with fused cuboid and navicular are limited to two size groups. These are, with reasonable certainty, referable to *Parablastomeryx* and *Machaeromeryx*. The remaining separate cuboids can be divided into eight size groups. The animals thus represented have a size range from smaller than *Parablastomeryx* to nearly as large as *Cervus canadensis*. But the two smallest groups of cuboids are not large enough to belong to animals with any of the known dentitions. None of the groups is, with any reasonable degree of certainty, referable to *Floridachoerus*. In view of the relative scarcity of the remains of that form, it is entirely possible that its tarsus is not represented. One of the groups of cuboids appears to be referable to

	Archaeomeryx	Leptotragulus	Hypertragulu
Deuterocone on P_2	absent	small	absent
" " P_3	well developed	well developed	small
Internal cingulum on P_3	weak anterior and posterior	moderate, anterior and posterior	strong, anterior posterior
Inner crescent on P_4	primitive	cervoid	primitive
Inner crescents on upper molars	separate	separate to base of tooth	anterior separate, erior confluent small amount of
Anterior and posterior cusps on P_2	nearly as high as central	?	absent
Ditto on P_3	nearly as high as central	?	anterior absent, terior low
Ditto on P_4	nearly as high as central	low	low
Postero-internal fold on P_2	absent	?	absent
Ditto on P_3	absent	?	absent
Ditto on P_4	rudimentary	present	rudimentary
Antero-internal	absent	?	absent
Ditto on P_3	present	?	absent
Ditto on P_4	present	present	present
Outer crescents on on lower molars	separate	separate	anterior separate terior confluent inner with sma amount of wear.
Heel of M_3	single	single	double
Orbit	closed	open posteriorly	open posteriorly
Nasals	normal	normal	normal
Lacrymal vacuity	absent	absent	small, between fr nasal, lacrymal maxilla
Cuboid and navicular	fused	probably separate	fused

anotragulus	Heteromeryx	Leptomeryx	Nothokemas
ent	small	well developed	well developed
ll	well developed	well developed	absent
erior only	weak anterior, strong posterior	strong anterior and posterior	strong, complete
itive	cervoid	cervoid	cervoid
luent with inner small amount of r	separate to base of tooth	separate to base of tooth	separate to base of tooth
ent	?	nearly as high as central	nearly as high as central
ent	?	nearly as high as central	nearly as high as central
ly as high as ral	?	nearly as high as central	nearly as high as central
nt	?	absent	short
nt	?	rudimentary	well developed
iplete	?	complete	complete
nt	?	present	present
nt	?	present	present
ent	?	present	present
luent with inner small amount of	?	separate to base of tooth	separate to base of tooth
ole	?	double	single
posteriorly	closed	closed	closed
nal	somewhat reduced	normal	normal
nt	small, between lacrymal and nasal	small, between frontal, nasal lacrymal and maxilla	large, all in maxilla
d	separate	fused	probably separate

Oxydactylus. Since the hypertraguloids are the only other artiodactyls known from this deposit, it seems reasonable to refer the remaining cuboids to this superfamily. Since there are no fused cuboids and naviculars in the size range referable to the Hypertraguloidea, it is reasonable to assume that the bones were separate in all of the species represented in the collections so far.

Affinities. While the teeth agree rather well with the Protoceratidae, the unreduced nasals and the large lacrymal vacuity exclude this genus from close kinship with that family. Certainly the kinship cannot be closer than common ancestry. The facial portion of the skull could be derived from *Leptomeryx*, *Heteromeryx*, or *Leptotragulus*. The posterior position of the internal nares finds its closest parallel in *Leptomeryx*. The derivation of the dentition of this genus from any of the Oligocene Hypertragulidae would involve:

1. Increase in the height of the crown.
2. Loss of the deuterocone on the second and third upper premolars.
3. Increase in the height of the anterior and posterior cusps on both upper and lower, second and third premolars.
4. Development of a postero-internal fold on the second and third lower premolars.
5. Loss of the inner lobe of the heel of the third lower molar.

An examination of the above table makes it obvious that *Nothokemas* cannot claim any close kinship with the tribe Hypertragulini. Probably the greatest difference is in the character of the upper and lower molars, which are more advanced than any other hypertragulid, except *Hypisodus*. *Archaeomeryx* and *Leptotragulus* are very early and very generalized forms which could be close to an ancestral position for many members of this family. At best their kinship with this genus cannot be any closer than that. *Heteromeryx* and *Leptomeryx* are later forms but are still very generalized. *Leptomeryx* is the more specialized of the two. Although the lower jaw of *Heteromeryx* is unknown, the characters of the skull and upper teeth do not indicate close kinship with this genus.

The bones of the feet appear to present rather constant characters among the Mammalia, and their major features are, in most cases, diagnostic of the larger groups. However, in the case of the fusion of the cuboid and navicular, there must have been a period of time when this was a variable character. Many of the genera of the Hypertragulidae are sufficiently well known that the fusion or nonfusion of the cuboid and navicular can be regarded as a constant character. On this basis we can exclude all except *Heteromeryx* and the Leptotragulini

from close kinship with this form. The Leptotragulini are not yet well known from complete skeletons and the reference of the tarsal elements to this group is only probable. *Heteromeryx* is known from a single skeleton only, and it is impossible to determine whether or not the separate cuboid and navicular are constant characters.

Summary. While the dentition of *Nothokemas* has many similarities in common with the Protoceratidae, the facial portions of the skulls are mutually exclusive for close kinship. The dental characters which this genus has in common with the Hypertragulidae are the same characters which that family has in common with the Protoceratidae. Since both families have members in which the cuboid and navicular are separate, this character is of little value in determining the systematic position of the genus. Consequently, in view of the seemingly isolated position of *Nothokemas*, it appears desirable to erect a new family, the *Nothokemadidae* (with the characters of the genus), to receive it.

The references to the literature are given by year and index letter used in the published bibliographies of Hay, and Camp et al.